APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/004,010	11/01/2001	Gerald G. Pechanek	800.0046	7418

27997 7590 10/05/2004	EXAMINER
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	ART UNIT	PAPER NUMBER
SUITE 230 DURHAM, NC 27713-7736	2124	

DATE MAILED: 10/05/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

	Application No.	Applicant(s)
Office Action Summary	10/004,010	PECHANEK ET AL.
	Examiner	Art Unit
	Chat C. Do	2124

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE <u>3</u> MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.
- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
  Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on <u>11/01/01;1/30/02;5/02/02;9/5/02;7/14/04</u>.

2a)☐ This action is **FINAL**.   2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) <u>1-41</u> is/are pending in the application.

    4a) Of the above claim(s) <u>29-36</u> is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) <u>1-28 and 37-41</u> is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on <u>5/2/02</u> is/are: a)☒ accepted or b)☐ objected to by the Examiner.

    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

    Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a)☐ All   b)☐ Some * c)☐ None of:

      1.☐ Certified copies of the priority documents have been received.

      2.☐ Certified copies of the priority documents have been received in Application No. _____.

      3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

    * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
   Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413)
   Paper No(s)/Mail Date. _____.

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

1.   Restriction to one of the following inventions is required under 35 U.S.C. 121:

    I.   Claims 1-28 and 37-41, drawn to complex multiplication in either one or two

    cycle, classified in class 708, subclass 622.

    II.   Claims 29-36, drawn to covariance matrix calculation, classified in class 708,

    subclass 200.

The inventions are distinct, each from the other because of the following reasons:

2.   Inventions of Group I and Group II are unrelated. Inventions are unrelated if it can be

shown that they are not disclosed as capable of use together and they have different modes of

operation, different functions, or different effects (MPEP § 806.04, MPEP § 808.01). In the

instant case the different inventions Group I is drawn to a complex multiplication structure for

performing complex multiplication in either one cycle or two cycles wherein Group II is drawn

to covariance matrix calculation involving particular set of instructions.

3.   Because these inventions are distinct for the reasons given above and have acquired a

separate status in the art as shown by their different classification, restriction for examination

purposes as indicated is proper.

4.   Because these inventions are distinct for the reasons given above and the search required.

for Group I is not required for Group II, restriction for examination purposes as indicated is

proper.

5.   Because these inventions are distinct for the reasons given above and have acquired a

separate status in the art because of their recognized divergent subject matter, restriction for

examination purposes as indicated is proper.

6.   During a telephone conversation with Joseph Agusta on 08/26/2004 a provisional

election was made without traverse to prosecute the invention of Group I drawn to complex

multiplication, claims 1-28 and 37-41. Affirmation of this election must be made by applicant in

replying to this Office action. Claims 29-36 are withdrawn from further consideration by the

examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

7.   Applicant is reminded that upon the cancellation of claims to a non-elected invention, the

inventorship must be amended in compliance with 37 CFR 1.48(b) if one or more of the

currently named inventors is no longer an inventor of at least one claim remaining in the

application. Any amendment of inventorship must be accompanied by a request under 37 CFR

1.48(b) and by the fee required under 37 CFR 1.17(i).

Specification

8.   Applicant is reminded of the proper language and format for an abstract of the disclosure.

The abstract should be in narrative form and generally limited to a single paragraph on a
separate sheet within the range of 50 to 150 words. It is important that the abstract not exceed
150 words in length since the space provided for the abstract on the computer tape used by the
printer is limited. The form and legal phraseology often used in patent claims, such as "means"
and "said," should be avoided. The abstract should describe the disclosure sufficiently to assist
readers in deciding whether there is a need for consulting the full patent text for details.

The language should be clear and concise and should not repeat information given in the
title. It should avoid using phrases which can be implied, such as, "The disclosure concerns,"
"The disclosure defined by this invention," "The disclosure describes," etc.

9.   The abstract of the disclosure is objected to because the abstract contains the language

that should be avoided as "a covariance matrix are described" in line 2. Correction is required.

See MPEP § 608.01(b).

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Claim Objections

10.   Claims 7-8 and 21-22 are objected to because of the following informalities:

        Claims 7-8 and 21-22 have same limitations cited claims 2-3 and 16-17

respectively. The applicant is advised to amend or cancel the claims 7-8 and 21-22 to

avoid duplicated claims in application.

        Appropriate correction is required.

Claim Rejections - 35 USC § 102

11.   The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the

basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on
> sale in this country, more than one year prior to the date of application for patent in the United States.

12.   Claims 15-28 are rejected under 35 U.S.C. 102(b) as being anticipated by Garde (U.S.

5,896,543).

        Re claim 15, Garde discloses in Figure 12C an apparatus (Figure 12C) for the

single cycle computation of complex multiplication (abstract), the apparatus comprising a

first storage means (610 and 612) for storing a first complex operand (610) and a second

complex operand (612), the first complex operand (610) including real component Xr

(real1) and imaginary component Xi (imag1), the second complex operand (612) including real component Yr (real2) and imaginary component Yi (imag2); multiplier means (602, 604, 606, and 608) for simultaneously performing multiplications of operation to produce products Xr*Yr, Xr*Yi, Xi*Yr and Xi*Yi (output of 602, 604, 606, and 608); a second storage means (buffer) for storing products Xr*Yr, Xr*Yi, Xi*Yr and Xi*Yi; adder means (624 and 626) for simultaneously performing additions (626) and subtractions (624) of operation to produce real result (Xr*Yr)-(Xi*Yi) (output of 624) and imaginary result (Xr*Yi)+(Xi*Yr) if a non-conjugated operation is being performed (output of 626), adder means (624 and 626) further for simultaneously performing additions (626) and subtractions (624) of operation to produce real result (Xr*Yr)+(Xi*Yi) (output of 626) and imaginary result (Xi*Yr)-(Xr*Yi) (output of 624) if a conjugated operation is being performed; and a third storage means (63) for storing the results of adder means (output of 624 and 626).

Re claim 16, Garde further discloses in Figure 12C accumulator means (630) for simultaneously performing accumulation in the cycle of operation to accumulate the results of adder means (outputs of 626 and 624) with the current contents of third storage means (620), wherein third storage means (630) is further for storing the results of accumulator means (630).

Re claim 17, Garde further discloses in Figure 12C extended precision storage means (630 with 32-bits storage instead of 16-bits), wherein accumulator means is further for simultaneously performing accumulation in the cycle of operation to accumulate the results of adder means (outputs of 626 and 624) with both the current contents of third

storage means (620) and the current contents of extended precision storage means (630),

wherein extended precision storage means is for storing extended precision results of

accumulator means (630).

Re claim 18, Garde further discloses in Figure 12C the complex operand

components Xr, Xi, Yr and Yi are each 16 bits (each input into multipliers 602, 604, 606,

and 608 wherein each multiplier is 16 by 16), the real and imaginary results are each 32

bits (therefore total is 32), and the extended precision results are each 8 bits (630).

Re claim 19, Garde further discloses in Figure 12C the complex operand

components Xr, Xi, Yr and Yi are each 16 bits (each input into multipliers 602, 604, 606,

and 608 wherein each multiplier is 16 by 16), and the real and imaginary results are each

32 bits (therefore total is 32).

Re claim 20, Garde further discloses in Figure 12C multiplier means is further for

simultaneously performing multiplications in the second cycle of operation utilizing a

second pair of operands (Figure 2 for more data process).

Re claim 21, it has limitations cited in claim 16. Thus, claim 21 is also rejected

under the same rationale as cited in the rejection of rejected claim 16.

Re claim 22, it has limitations cited in claim 17. Thus, claim 22 is also rejected

under the same rationale as cited in the rejection of rejected claim 17.

Re claim 23, it is a method claim of claim 15. Thus, claim 23 is also rejected

under the same rationale as cited in the rejection of rejected claim 15.

Re claim 24, it is a method claim of claim 16. Thus, claim 24 is also rejected

under the same rationale as cited in the rejection of rejected claim 16.

Re claim 25, it is a method claim of claim 17. Thus, claim 25 is also rejected

under the same rationale as cited in the rejection of rejected claim 17.

Re claim 26, it is a method claim of claim 17. Thus, claim 26 is also rejected

under the same rationale as cited in the rejection of rejected claim 17.

Re claim 27, it is a method claim of claim 18. Thus, claim 27 is also rejected

under the same rationale as cited in the rejection of rejected claim 18.

Re claim 28, it is a method claim of claim 19. Thus, claim 28 is also rejected

under the same rationale as cited in the rejection of rejected claim 19.

Claim Rejections - 35 USC § 103

13.   The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all

obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in
> section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are
> such that the subject matter as a whole would have been obvious at the time the invention was made to a person
> having ordinary skill in the art to which subject matter pertains. Patentability shall not be negatived by the
> manner in which the invention was made.

14.   Claims 1-14 and 37-41 are rejected under 35 U.S.C. 103(a) as being obvious over Garde

(U.S. 5,896,543) in view of Kohn (U.S. 5,204,828).

Re claim 1, Garde discloses in Figure 12C an apparatus (Figure 12C) for the

computation of complex multiplication (abstract), the apparatus comprising a first storage

means (610 and 612) for storing a first complex operand (610) and a second complex

operand (612), the first complex operand (610) including real component Xr (real1) and

imaginary component Xi (imag1), the second complex operand (612) including real

component Yr (real2) and imaginary component Yi (imag2); multiplier means (602, 604,

606, and 608) for simultaneously performing multiplications of operation to produce

products Xr*Yr, Xr*Yi, Xi*Yr and Xi*Yi (output of 602, 604, 606, and 608); a second

storage means (buffer) for storing products Xr*Yr, Xr*Yi, Xi*Yr and Xi*Yi; adder

means (624 and 626) for simultaneously performing additions (626) and subtractions

(624) of operation to produce real result (Xr*Yr)-(Xi*Yi) (output of 624) and imaginary

result (Xr*Yi)+(Xi*Yr) if a non-conjugated operation is being performed (output of 626),

adder means (624 and 626) further for simultaneously performing additions (626) and

subtractions (624) of operation to produce real result (Xr*Yr)+(Xi*Yi) (output of 626)

and imaginary result (Xi*Yr)-(Xr*Yi) (output of 624) if a conjugated operation is being

performed; and a third storage means (63) for storing the results of adder means (output

of 624 and 626).   Garde does not clearly discloses the above calculation is performed in

two cycles wherein all the multiplications are performed in first cycle and the addition

and subtraction are performed in second cycle. However, Kohn discloses in Figure 2 that

a set of multiplication and a set of addition would be performed in two cycles (claim 4)

wherein the multiplication is done in a cycle (col. 8 lines 27-28) and addition/subtraction

is done in another cycle (col. 8 lines 30-31). Therefore, it would have been obvious to a

person having ordinary skill in the art at the time the invention is made to perform the

above calculation in two cycles wherein all the multiplications are performed in first

cycle and the addition and subtraction are performed in second cycle as seen in Kohn's

invention into Garde's invention because it would enable to increase the system

performance by reducing the number of clock cycles to process the data.

Re claim 2, Garde further discloses in Figure 12C accumulator means (630) for simultaneously performing accumulation in the cycle of operation to accumulate the results of adder means (outputs of 626 and 624) with the current contents of third storage means (620), wherein third storage means (630) is further for storing the results of accumulator means (630).

Re claim 3, Garde further discloses in Figure 12C extended precision storage means (630 with 32-bits storage instead of 16-bits), wherein accumulator means is further for simultaneously performing accumulation in the cycle of operation to accumulate the results of adder means (outputs of 626 and 624) with both the current contents of third storage means (620) and the current contents of extended precision storage means (630), wherein extended precision storage means is for storing extended precision results of accumulator means (630).

Re claim 4, Garde further discloses in Figure 12C the complex operand components Xr, Xi, Yr and Yi are each 16 bits (each input into multipliers 602, 604, 606, and 608 wherein each multiplier is 16 by 16), the real and imaginary results are each 32 bits (therefore total is 32), and the extended precision results are each 8 bits (630).

Re claim 5, Garde further discloses in Figure 12C the complex operand components Xr, Xi, Yr and Yi are each 16 bits (each input into multipliers 602, 604, 606, and 608 wherein each multiplier is 16 by 16), and the real and imaginary results are each 32 bits (therefore total is 32).

Re claim 6, Garde further discloses in Figure 12C multiplier means is further for simultaneously performing multiplications in the second cycle of operation utilizing a second pair of operands (Figure 2 for more data process).

Re claim 7, it has limitations cited in claim 2. Thus, claim 7 is also rejected under the same rationale as cited in the rejection of rejected claim 2.

Re claim 8, it has limitations cited in claim 3. Thus, claim 8 is also rejected under the same rationale as cited in the rejection of rejected claim 3.

Re claim 9, it is a method claim of claim 1. Thus, claim 9 is also rejected under the same rationale as cited in the rejection of rejected claim 1.

Re claim 10, it is a method claim of claim 2. Thus, claim 10 is also rejected under the same rationale as cited in the rejection of rejected claim 2.

Re claim 11, it is a method claim of claim 3. Thus, claim 11 is also rejected under the same rationale as cited in the rejection of rejected claim 3.

Re claim 12, it is a method claim of claim 3. Thus, claim 12 is also rejected under the same rationale as cited in the rejection of rejected claim 3.

Re claim 13, it is a method claim of claim 4. Thus, claim 113 is also rejected under the same rationale as cited in the rejection of rejected claim 4.

Re claim 14, it is a method claim of claim 5. Thus, claim 14 is also rejected under the same rationale as cited in the rejection of rejected claim 5.

Re claim 37, it has limitations cited in claim 1. Thus, claim 37 is also rejected under the same rationale as cited in the rejection of rejected claim 1.

Re claim 38, it has limitations cited in claim 2. Thus, claim 38 is also rejected under the same rationale as cited in the rejection of rejected claim 2.

Re claim 39, it has limitations cited in claim 3. Thus, claim 39 is also rejected under the same rationale as cited in the rejection of rejected claim 3.

Re claim 40, it has limitations cited in claim 4. Thus, claim 40 is also rejected under the same rationale as cited in the rejection of rejected claim 4.

Re claim 41, it has limitations cited in claim 5. Thus, claim 41 is also rejected under the same rationale as cited in the rejection of rejected claim 5.

Conclusion

15.   The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

a.   U.S. Patent No. 6,625,630 to Vinitzky discloses a two cycle FFT.

b.   U.S. Patent No. 5,983,253 to Fischer et al. disclose a computer system for performing complex digital fitlers.

c.   U.S. Patent Application Publication No. 0014458 A1 to Fischer et al. disclose a method and apparatus for storing complex numbers in formats which allow efficient complex multiplication operations to be performed and for performing such complex multiplication operations.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Chat C. Do whose telephone number is (703) 305-5655. The examiner can normally be reached on M => F from 7:00 AM to 4:30 PM.
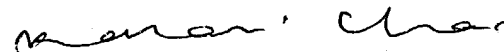
If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Chaki Kakali can be reached on (703) 305-9662. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Chat C. Do
Examiner
Art Unit 2124

September 27, 2004

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